



Urban Heat + Urban Forestry Accelerator Sequence

Module 2: Urban Forestry Syllabus

Online Zoom Webinar
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Module Description

Many people intuitively appreciate the ways trees improve the physical environment and human experience of cities, and there is a growing interest in using trees to confront some of the environmental challenges facing cities, including excess heat. The transformation of urban forests for greater heat resilience will require fundamental changes in the underlying natural and social processes. In Module 2, we will explore methods commonly used to investigate the current state of urban forests, synthesize relevant information, and develop goals for heat resilience.

Module Learning Objectives

After successful completion of module 2, you will be able to:

1. Describe factors influencing the development of urban forests over time
2. Outline suitable ways to evaluate and monitor urban forests
3. Identify and evaluate opportunities to expand and protect tree canopy
4. Develop collaborative strategies to mitigate heat through urban forestry initiatives

Module Format & Materials

Session 1: Key Concepts and Best Practices in Urban Forestry

Learning Objectives

1. Characterize urban forests as complex adaptive socio-ecological systems
2. Describe the relevance of disciplinary expertise and lived experience for confronting challenges in urban forestry
3. Review the significance of coordinating among diverse actors and communities to build consensus about urban forests

Resource Materials

Healy, M., Rogan, J., Roman, L.A., Nix, S., Martin, D.G., Geron, N., 2022. Historical urban tree canopy cover change in two post-industrial cities. *Environ. Manage.* 70, 16–34.
<https://doi.org/10.1007/s00267-022-01614-x>

McDonald, R.I., Biswas, T., Sachar, C., Housman, I., Boucher, T.M., Balk, D., Nowak, D., Spotswood, E., Stanley, C.K., Leyk, S., 2021. The tree cover and temperature disparity in US urbanized areas: Quantifying the association with income across 5,723 communities. PLoS ONE 16, e0249715. <https://doi.org/10.1371/journal.pone.0249715>

McDonnell, M.J., Pickett, S.T.A., 1990. Ecosystem structure and function along urban-rural gradients: An unexploited opportunity for ecology. Ecology 71, 1232–1237. <https://doi.org/10.2307/1938259>

Rogers, K.H., Luton, R., Biggs, H., (Oonsie) Biggs, R., Blignaut, S., Choles, A.G., Palmer, C.G., Tangwe, P., 2013. Fostering complexity thinking in action research for change in social-ecological systems. Ecol. Soc. 18, 31. <https://doi.org/10.5751/ES-05330-180231>

Roman, L., Catton, I., Greenfield, E., Pearsall, H., Eisenman, T., Henning, J., 2021. Linking urban tree cover change and local history in a post-industrial city. Land 10, 403. <https://doi.org/10.3390/land10040403>

Homework

Find and review existing resources available to describe your urban forest. Before our next sessions, consider the following questions and post your response in the Thinkific Urban Forestry Discussion Forum:

- What are some of the important social or natural processes affecting the extent or condition of your urban forest?
- How does your urban forest reflect broader social or natural challenges?
- What plans does your community already have to address heat risk (or other challenges) through urban forestry initiatives?

Session 2: Urban Tree Canopy Assessment and Planning Tools

Learning Objectives

1. Relate the insights about urban forests afforded by different types of information, including canopy assessments and sociodemographic data
2. Identify opportunities to expand and protect tree canopy using complementary data sources
3. Evaluate the capacity for heat mitigation with different configurations of urban tree canopy

Resource Materials

American Forests, 2023. Tree Equity Score. Available at: <https://treeequityscore.org> (Accessed: 16 Apr 2023).

i-Tree Tools, 2023. i-Tree Landscape. Available at: <https://landscape.itreetools.org> (Accessed: 16 Apr 2023).

Multi-Resolution Land Characteristics Consortium, 2023. National Land Cover Database – Tree Canopy. Available at: <https://www.mrlc.gov/data?f%5B0%5D=category%3ATree%20Canopy> (Accessed: 16 Apr 2023).

O’Neil-Dunne, J., MacFaden, S., Royar, A., 2014. A versatile, production-oriented approach to high-resolution tree-canopy mapping in urban and suburban landscapes using GEOBIA and data fusion. *Remote Sens.* 6, 12837–12865. <https://doi.org/10.3390/rs61212837>

Pourpeikari Heris, M., Bagstad, K.J., Troy, A.R., O’Neil-Dunne, J.P.M., 2022. Assessing the accuracy and potential for improvement of the National Land Cover Database’s tree canopy cover dataset in urban areas of the conterminous United States. *Remote Sens.* 14, 1219. <https://doi.org/10.3390/rs14051219>

Treglia, M.L., Piland, N.C., Leu, K., Van Slooten, A., Maxwell, E.N., 2022. Understanding opportunities for urban forest expansion to inform goals: Working toward a virtuous cycle in New York City. *Front. Sustain. Cities* 4, 944823. <https://doi.org/10.3389/frsc.2022.944823>

United States Department of Agriculture, 2023. National Agricultural Imagery Program. Available at: <https://naip-usdaonline.hub.arcgis.com> (Accessed: 16 Apr 2023).

Homework

Review the following case study:

de Guzman, E., Kalkstein, L.S., Sailor, D., Eisenman, D., Sheridan, S., Kirner, K., Maas, R., Shickman, K., Fink, D., Parfrey, J., Chen, Y., 2020. Rx for Hot Cities: Climate Resilience Through Urban Greening and Cooling in Los Angeles. TreePeople, Los Angeles, CA.

Before our next session, consider the following questions and post your responses in the Thinkfic Urban Forestry Discussion Forum:

- How might the analyses reported by the LA Cooling Collaborative facilitate actions in urban forestry initiatives?
- Which policy or program recommendations could be feasibly adopted by your community?
- What limitations might constrain implementation of the project's recommendations?

Session 3: Managing Urban Forests for Heat Resilience

Learning Objectives

1. Explore contemporary examples of heat mitigation efforts in urban forestry
2. Recommend a collaborative process for synthesizing information and developing goals for heat resilience in your urban forest
3. Propose a comprehensive strategy for implementing plans and monitoring outcomes

Resource Materials

Alonzo, M., Baker, M.E., Gao, Y., Shandas, V., 2021. Spatial configuration and time of day impact the magnitude of urban tree canopy cooling. *Environ. Res. Lett.* 16, 084028. <https://doi.org/10.1088/1748-9326/ac12f2>

Declet-Barreto, J., Knowlton, K., Jenerette, G.D., Buyantuev, A., 2016. Effects of urban vegetation on mitigating exposure of vulnerable populations to excessive heat in Cleveland, Ohio. *Weather Clim. Soc.* 8, 507–524. <https://doi.org/10.1175/WCAS-D-15-0026.1>

Jenerette, G.D., Harlan, S.L., Stefanov, W.L., Martin, C.A., 2011. Ecosystem services and urban heat riskscape moderation: Water, green spaces, and social inequality in Phoenix, USA. *Ecol. Appl.* 21, 2637–2651. <https://doi.org/10.1890/10-1493.1>

Ossola, A., Jenerette, G.D., McGrath, A., Chow, W., Hughes, L., Leishman, M.R., 2021. Small vegetated patches greatly reduce urban surface temperature during a summer heatwave in Adelaide, Australia. *Landsc. Urban Plan.* 209, 104046. <https://doi.org/10.1016/j.landurbplan.2021.104046>

Zipper, S.C., Schatz, J., Kucharik, C.J., Loheide, S.P., 2017. Urban heat island-induced increases in evapotranspirative demand. *Geophys. Res. Lett.* 44, 873–881. <https://doi.org/10.1002/2016GL072190>

Zipper, S.C., Schatz, J., Singh, A., Kucharik, C.J., Townsend, P.A., Loheide, S.P., 2016. Urban heat island impacts on plant phenology: Intra-urban variability and response to land cover. *Environ. Res. Lett.* 11, 054023. <https://doi.org/10.1088/1748-9326/11/5/054023>

Ziter, C.D., Pedersen, E.J., Kucharik, C.J., Turner, M.G., 2019. Scale-dependent interactions between tree canopy cover and impervious surfaces reduce daytime urban heat during summer. *Proc. Natl. Acad. Sci.* 116, 7575–7580. <https://doi.org/10.1073/pnas.1817561116>

Homework

Meet with your city or organization’s delegate for Module 3 to discuss your thoughts about the significance of community engagement in urban forestry.

Module Schedule

Note: All session dates are listed in Mountain Time Zone.

Date(s)	Session/Topic	Homework	Due Date
27 April 2023 12 - 1:30pm MST	Session 1: Key Concepts and Best Practices in Urban Forestry	Review: Recommended resources and existing resources available to describe your urban forest Action: See the guiding questions above and brainstorm before Session 2.	5 May 2023
5 May 2023 9 - 10:30am MST	Session 2: Urban Tree Canopy Assessment and Planning Tools	Review: Recommended case studies Action: Consider the guiding questions above before Session 3.	19 May 2023
19 May 2023 9 - 10:30am MST	Session 3: Managing Urban Forests for Heat Resilience	Handoff: Meet with your city or organization's delegate for Module 3 to discuss your thoughts about the significance of community engagement in urban forestry.	Module 3 Launch Date TBC